# Comparison of Clinical Findings and Psychosocial Factors in Patients with Atypical Odontalgia and Temporomandibular Disorders

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***Aims:*** *To systematically compare clinical findings and psychosocial factors between patients suffering from atypical odontalgia (AO) and an age- and gender-matched group of patients with temporomandibular disorders (TMD).* ***Methods:*** *Forty-six AO patients (7 men and 39 women; mean age, 56 years) were compared with 41 TMD patients (8 men and 33 women; mean age, 58 years).* ***Results:*** *Mean pain intensity at the time of inclusion in the study was similar between the groups (TMD: 5.3 ± 0.4, AO: 5.0 ± 0.3), but pain duration was longer in AO patients (AO: 7.7 ± 1.1 years, TMD: 4.5 ± 0.1 years). Eighty-three percent of the AO patients and 15% of TMD patients reported pain onset in relation to dental/surgical procedures. Episodic tension-type headache (TTH) occurred equally in both groups (TMD: 46%, AO: 46%), but TMD patients more frequently experienced chronic TTH (TMD: 35%, AO: 18%), myofascial TMD (TMD: 93%, AO: 50%), and temporomandibular joint disorders (TMD: 66%, AO: 2%). Overall, TMD patients had lower pressure pain thresholds and poorer jaw function than AO patients. Mean depression and somatization scores were moderate to severe in both groups, and widespread pain was most common in TMD patients.* ***Conclusion:*** *AO and TMD share some characteristics but differ significantly in report of dental trauma, jaw function, pain duration, and pain site.*
J OROFAC PAIN 2008;22:7–14

**Key words:** neuropathic pain, orofacial pain, pain characteristics, psychosocial status, quality of life

Atypical odontalgia (AO) is an enigmatic chronic condition of dental pain or persistent pain after a surgical intervention such as endodontic treatment or tooth extraction.[1,2] AO is diagnosed in the absence of pathological findings in clinical or radiologic examinations.[3,4] Researchers in the field of orofacial pain still disagree on the underlying mechanisms of AO pain. It has been suggested that AO is psychological, idiopathic, or neuropathic in origin.[3,5–7] Recent research has demonstrated that AO is not based exclusively on psychological mechanisms; abnormalities in somatosensory sensitivity and blink reflexes have been demonstrated in AO patients.[8–10] These findings suggest altered neural processing, which may originate from deafferentiation of nociceptive primary afferents in the tooth pulp.[3,8–10]

Some researchers suggest that AO shares pain mechanisms with other chronic orofacial pain conditions, such as atypical facial pain and temporomandibular disorders (TMD), but is distinguished by the location of the pain.[5] In TMD, pain is located in the temporomandibular joint or masticatory muscles; in AO, pain is felt in a tooth region; and in atypical facial pain, pain is confined to the

face. Much is known about TMD concerning clinical features, epidemiology, psychosocial factors, hormonal influences, and response to experimental pain.[11–14] In contrast, AO is poorly understood, and risk factors for AO are currently hypothetical at best; for example, genetic factors have been suggested.[9] Management of AO is hampered by this lack of knowledge about pain mechanisms and risk factors. Recently, TMD pain, tension-type headache (TTH), and widespread pain were found to be significantly more common in AO patients than in healthy matched controls.[15] Furthermore, somatization, depression, and impaired quality of life affected AO patients more than healthy controls.[9] It is unclear whether AO patients differ from patients with other well-known orofacial pain conditions with respect to these findings.

The aim of this study was to systematically compare clinical findings and psychosocial factors between patients suffering from AO and an age- and gender-matched group of TMD patients. A description of differences in these factors may be an important platform for the future generation of hypotheses regarding pathophysiological mechanisms.

## Materials and Methods

### Subjects

Forty-six consecutive AO patients (7 men and 39 women; mean age, 56 years; range, 31 to 81 years) were compared with 41 consecutive age- and gender-matched TMD patients (8 men and 33 women; mean age, 58 years; range, 27 to 86 years). The 46 AO patients were recruited from orofacial pain clinics in Linköping,[9] Jönköping,[10] Kalmar,[10] and Malmö[16] in Sweden. The TMD patients were all recruited from Malmö. Data were collected during a 2-year period (2002–2004).

To be included, AO patients were required to have had pain in a tooth or a tooth region. The pain was required to be chronic (> 6 months), with no detectable pathology in clinical or radiologic examinations. TMD patients were required to have pain in the last month and a TMD Axis I pain diagnosis (myofascial pain, arthralgia, and/or osteoarthritis) according to the Research Diagnostic Criteria for TMD (RDC/TMD).[12] Exclusion criteria for both groups were trigeminal neuralgia, herpes zoster, apical periodontitis, maxillary sinusitis, cluster headache, and paroxysmal hemicrania.

The Regional Ethics Review Board at Linköping University Hospital and Lund University approved the study. Written informed consent was obtained from all patients before participation in the study. The patients received no monetary compensation. The present group of AO patients has been compared with healthy controls in a recent study.[15]

### Study Design

All patients underwent a dental and radiographic examination and filled out a series of questionnaires. The oral examination comprised an intraoral evaluation of teeth and nearby structures and radiographic examination of the jaws and teeth (panoramic and periapical radiographs). An experienced orofacial pain specialist (TL) performed the RDC/TMD examination and cervical spine examination.

### Clinical Measures

**Oral Examination.** Determinations of the number of teeth (0 to 32) and number of root fillings (0 to 32) were based upon clinical and radiologic examinations. Mandibular range of motion variables (unassisted opening without pain, maximum unassisted opening, and maximum assisted opening) were measured in millimeters. The number of painful craniofacial muscle sites was determined based on the patient's response to muscle palpation of 20 sites according to the RDC/TMD examination (0–20).

**TMD and TTH Diagnoses.** Both groups underwent the RDC/TMD examination. Three groups of diagnoses were possible: (I) myofascial pain, (II) disc displacement, and (III) joint disorder (arthralgia, arthritis, and arthrosis).[12] TTH was diagnosed according to the criteria of the International Headache Society, and TTH headaches could be subclassified as episodic (headache < 15 days/month) or chronic (headache > 15 days/month).[17] Patients were asked only about TTH symptoms that had occurred within the previous month.

**Pressure Pain Threshold.** The pressure (kPa) that the patient first perceived to be painful was determined with a pressure algometer (Somedic, Hörby, Sweden). A constant pressure of 30 kPa/s with a 1.0-cm diameter probe was applied, and the average value of 3 measurements was calculated. Pressure stimuli were separated by an interval of about 2 minutes. The pressure pain threshold (PPT) over the attachment of the right and left masseter muscles and on the thenar of the right hand was measured.

### Self-Report Measures

**Patient Characteristics, Pain Status, and Psychological Status.** Age, gender, and number of therapists visited because of AO pain or TMD pain were noted. The question "What treatment have you undergone?" was followed by 12 treatment options (yes/no).

The patients reported pain duration. Axis II of the RDC/TMD[12] was completed by all patients. This included 3 evaluations of pain intensity on a 0-to-10 numeric rating scale (NRS): pain on the day of the study ($NRS_{now}$), average pain in the last 6 months ($NRS_{mean}$), and worst pain in the last 6 months ($NRS_{worst}$). Furthermore, measures of jaw function and somatization and depression scores from a short version of the Symptom Checklist 90-Revised (SCL-90R) were evaluated on the RDC/TMD questionnaire.

The patients were asked if the following factors/activities increased or reduced their pain: resting, certain movements, lifting, carrying, coughing, touch, cold, heat, chewing, lying down, walking, and yawning. The patients also had the opportunity to state whether nothing affected their pain.

Patients marked all bodily areas (head, face, throat, neck/shoulder, chest, abdomen, back, upper extremities, lower extremities, and inside the mouth) in which they experienced pain on anatomic drawings, and the proportion of patients in each group reporting more than 3 pain areas was calculated.[15]

The Swedish version of the short-form McGill Pain Questionnaire (MPQ), which includes 15 descriptors (11 sensory, 4 affective) scored on a 0-to-3-point scale, was used.[16,18] The 36-item short-form general health survey (SF-36) was used to evaluate how the patients' general health affected their quality of life.[19] Eight domains were covered: physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional, and mental health.

**Jaw Function Limitation Scale.** A measure of how jaw function is limited during different activities was evaluated with the Jaw Function Limitation Scale (JFLS), which includes 14 items in the domains opening, chewing, communication, and emotions.[20] Patients rated their limitation on a 0-to-3-point scale. "0" corresponded to no limitation and "3" to extreme limitation.

### Statistical Methods

Results are presented as means ± SEM. The *t* test for independent means was used to analyze differences between groups in continuous variables, and the $\chi^2$ test was used for comparisons of proportions. *P* values less than .05 were considered statistically significant. No Bonferroni correction was used because this study was considered exploratory.

## Results

### Clinical Measures

On average, AO patients had 2.6 fewer natural teeth than TMD patients ($P = .049$, Table 1). The number of root fillings was similar for the 2 groups ($P = .828$, Table 1). Mandibular range of motion, except for maximum unassisted jaw opening, was significantly reduced in TMD patients compared with AO patients ($P < .003$, Table 1). Number of muscle sites painful upon palpation (0 to 20) was significantly higher in TMD patients than in AO patients ($P < .001$, Table 1).

### TMD and TTH Diagnoses

A significantly higher proportion of TMD patients had a diagnosis of myofascial pain (AO: 50%, TMD: 96%) and joint disorders (AO: 2%, TMD: 59%) compared with AO patients ($P < .001$, Table 2). No significant difference between groups in the proportion of the patients with a disc-displacement diagnosis was detected (AO: 26%, TMD: 11%; $P = .060$, Table 2). Forty-six percent of the AO patients and 46% of the TMD patients suffered from episodic TTH ($P = .870$). In contrast, 18% of AO patients versus 35% of TMD patients suffered from chronic TTH ($P = .007$, Table 2).

### PPTs

Overall, AO patients had significantly ($P = .002$) higher PPTs than TMD patients. For the hand, PPTs of 312 ± 146 kPa for the AO group and 229 ± 124 kPa for the TMD group were found. For the left masseter muscle, PPTs of 182 ± 78 kPa for the AO group and 123 ± 60 kPa for the TMD group were reported. For the right masseter muscle, the PPTs were 185 ± 72 kPa for the AO group and 112 ± 54 kPa for the TMD group. For both groups, the masseter region was significantly more sensitive to pressure pain than the hand region ($P < .001$), and there was no difference between sides in either the TMD or the AO group ($P > .892$).

**Table 1 Clinical Measures (Means ± SEM)**

| | AO (n = 46) | | TMD (n = 41) | | |
|---|---|---|---|---|---|
| | Mean | SEM | Mean | SEM | *P* |
| Remaining teeth | 23.5 | 1.0 | 26.1 | 0.9* | .049 |
| Root fillings | 3.4 | 0.4 | 3.2 | 0.5 | .828 |
| Jaw opening without pain (mm) | 47.5 | 0.9 | 37.0 | 1.5* | < .001 |
| Maximum unassisted jaw opening (mm) | 49.6 | 1.2 | 43.4 | 1.8 | .146 |
| Maximum assisted jaw opening (mm) | 49.0 | 1.3 | 43.8 | 1.1* | .003 |
| Muscle sites painful on palpation | 5.6 | 0.6 | 10.5 | 0.8* | < .001 |

* indicates a significant difference between groups ($P \leq .049$).

**Table 2 Proportion (%) of AO and TMD Patients Who Received 1 or More TMD or TTH Diagnoses**

| Diagnosis | AO (n = 46) | TMD (n = 41) | *P* |
|---|---|---|---|
| Myofascial TMD | 50 | 96* | < .001 |
| Disc displacement | 26 | 11 | .060 |
| TMJ disorders | 2 | 59* | < .001 |
| Episodic TTH | 46 | 46 | .870 |
| Chronic TTH | 18 | 35* | .007 |

TMJ = temporomandibular joint.
* indicates a significant difference between groups ($P \leq .007$).

### Self-Report Measures

**Pain Characteristics and Psychological Status.** On average, pain duration was significantly longer in AO patients than TMD patients (AO: 7.7 ± 1.1 years, TMD: 4.5 ± 0.1 years, $P = .042$), but no between-group differences in experienced pain intensity were found ($NRS_{now}$, $NRS_{mean}$, and $NRS_{worst}$; $P \geq .482$, Table 3). Between-group differences in depression and somatization scores on the SCL-90R were nonsignificant ($P > .073$). In both groups, average depression scores were moderate to severe (AO: 1.1 ± 0.1, TMD: 0.9 ± 0.1) and somatization scores were severe (AO: 1.1 ± 0.1, TMD: 1.3 ± 0.1; Table 3). Eighty-three percent of AO patients and 15% of TMD patients reported pain onset in relation to dental treatment, trauma, or oral surgery ($P < .001$).

Table 4 lists pain-relieving and pain-worsening factors. Twenty-nine percent of TMD patients reported heat to give pain relief, whereas 19% of AO patients reported heat to worsen pain. In contrast, both conditions seemed to be worsened by cold. Yawning worsened pain in 60% of TMD patients and only 12% of AO patients ($P < .001$).

TMD patients reported pain in other areas of the body more frequently than AO patients (Table 5), and the proportion of patients reporting more than 3 pain areas was significantly higher in the TMD group than in the AO group ($P = .022$, Table 5).

Table 6 lists the frequencies of pain descriptors used on the short-form MPQ. A higher proportion of AO patients than TMD patients used the word "aching," and TMD patients more frequently described their pain as "gnawing," "cramping," and "shooting" ($P < .05$).

None of the SF-36 domains were significantly different between groups ($P > .054$), although a tendency toward lower scores in the "physical functioning" domain (TMD: 64.0 ± 4.5, AO: 75.1 ± 3.6, $P = .054$) was observed in TMD patients compared with AO patients.

**JFLS.** TMD patients had significantly higher limitation scores in the "opening" (AO: 1.3 ± 0.3, TMD: 2.7 ± 0.4, $P = .010$) and "total" (AO: 4.5 ± 0.8, TMD: 10.2 ± 2.3, $P = .024$) JFLS scores and a tendency toward a higher limitation score in the "Communication and Emotions" category (AO: 0.8 ± 0.3, TMD: 1.8 ± 0.4, $P = .057$) than AO patients.

**Table 3 Pain Characteristics and Psychological Status**

| | AO (n = 46) | | TMD (n = 41) | | |
|---|---|---|---|---|---|
| | Mean | SEM | Mean | SEM | *P* |
| Pain status | | | | | |
| Pain duration (y) | 7.7 | 1.1* | 4.5 | 0.1 | .042 |
| Present pain (0–10 NRS) | 5.0 | 0.3 | 5.3 | 0.4 | .499 |
| Mean pain (0–10 NRS) | 5.6 | 0.3 | 5.6 | 0.3 | .952 |
| Worst pain (0–10 NRS) | 7.3 | 0.3 | 7.6 | 0.3 | .482 |
| Psychological status | | | | | |
| Depression | 1.1 | 0.1 | 0.9 | 0.1 | .727 |
| Somatization | 1.1 | 0.1 | 1.3 | 0.1 | .342 |

Scores on depression and somatization were derived from the SCL-90R from the RDC/TMD questionnaire. * indicates a significant difference between groups ($P = .042$).

**Table 4 Self-reported Pain-relieving and Exacerbating Factors/Activities**

| | Relieves pain (%) | | | Exacerbates pain (%) | | |
|---|---|---|---|---|---|---|
| | AO | TMD | *P* | AO | TMD | *P* |
| Resting | 28 | 38 | .998 | 9 | 7 | .717 |
| Certain movement | 5 | 12 | .224 | 9 | 21 | .120 |
| Coughing | 0 | 0 | > .99 | 5 | 5 | .981 |
| Lying down | 5 | 17(*) | .072 | 14 | 14 | .965 |
| Walking | 2 | 14* | .045 | 7 | 7 | .976 |
| Lifting | 2 | 0 | .320 | 5 | 14 | .128 |
| Carrying | 2 | 0 | .320 | 5 | 14 | .128 |
| Touch | 7 | 12 | .605 | 19 | 10 | .229 |
| Cold | 2 | 0 | > .99 | 35 | 29 | .532 |
| Heat | 9 | 29* | .023 | 19* | 2 | .015 |
| Chewing | 5 | 5 | > .99 | 40 | 55 | .160 |
| Yawning | 0 | 2 | .148 | 12 | 60* | < .001 |
| Nothing | 35* | 7 | .002 | 9 | 14 | .312 |

Proportion of group reporting each factor is given as a percentage. * indicates a significantly higher proportion of one group reporting a factor to relieve or worsen pain compared to the other group ($P \leq .045$). (*) denotes $P = .072$.

**Table 5 Proportion (%) of Patients Who Marked Different Areas as Painful on Anatomic Drawings**

| | AO (n = 46) (%) | TMD (n = 41) (%) | *P* |
|---|---|---|---|
| Head | 17 | 46* | .003 |
| Face | 79 | 97* | .009 |
| Throat | 11 | 10 | .619 |
| Chest | 11 | 13 | .506 |
| Abdomen | 9 | 10 | .534 |
| Neck/shoulder | 40 | 62(*) | .051 |
| Back | 30 | 59* | .006 |
| Upper extremities | 19 | 54* | .001 |
| Lower extremities | 23 | 38 | .130 |
| Inside the mouth | 100 | 23* | < .001 |
| More than 3 pain areas | 32 | 56* | .022 |

*Denotes differences between groups ($P < .022$). (*) indicates $P < .051$.

**Table 6 Proportion (%) of Patients Who Used Each Word from the Short-Form MPQ**

| | AO (n = 46) | TMD (n = 41) | *P* |
|---|---|---|---|
| Aching | 91(*) | 80 | .069 |
| Tender | 78 | 76 | .848 |
| Throbbing | 54 | 46 | .464 |
| Exhausting | 44 | 46 | .908 |
| Heavy | 38 | 50 | .240 |
| Splitting | 36 | 39 | .725 |
| Stabbing | 36 | 35 | .938 |
| Fearful | 33 | 17 | .080 |
| Burning | 31 | 28 | .766 |
| Sharp | 27 | 28 | .865 |
| Punishing—cruel | 24 | 15 | .269 |
| Gnawing | 22 | 43* | .031 |
| Sickening | 18 | 13 | .531 |
| Cramping | 16 | 35* | .035 |
| Shooting | 17 | 30* | .049 |

*indicates differences between groups ($P \leq .05$). (*) indicates $P = .069$.

## Discussion

The overall finding in this exploratory study using multiple clinical and psychosocial factors was that although pain intensity and the description of pain were very similar between AO and TMD patients, AO differed significantly from TMD in several aspects.

### Study Populations

The TMD patients were matched according to age and sex. Both conditions have been reported to be more prevalent in women than in men,[10,11] but the TMD patients in this study were somewhat older than is usually reported due to the matching procedure.[21,22] On a population basis, TMD is much more prevalent than AO, which is indirectly seen in the need to involve several orofacial pain clinics to find 46 AO patients for this study. The AO sample in the present study was considered representative of AO patients in general, because the age- and gender distribution is similar to those reported in other studies.[3,10] Furthermore, the sample size in this study sufficed to demonstrate significant differences in different parameters.

### Self-reported Pain Parameters

Because pain intensity and use of pain descriptors were similar in the 2 groups (despite some minor differences), the MPQ cannot be considered an essential tool for distinguishing between these conditions. This indicates some qualitative similarities in the manifestation of the 2 pain conditions. Nonetheless, researchers are currently discussing whether pain descriptors can be used to discriminate between, for example, neuropathic and non-neuropathic pain conditions.[23] Some researchers have recently developed additional pain quality measuring tools, such as the Neuropathic Pain Scale,[24] to aid the diagnostic separation of neuropathic and non-neuropathic pain conditions. Others argue that since considerable overlap exists between pain descriptors used in neuropathic and nociceptive pain states, they should not be used as a basis for diagnosis.[25] Consequently, the description of the pain experienced by AO and TMD patients in the present study offers some support for a similar clinical presentation of nociceptive processing in the 2 conditions.

On the other hand, the mean duration of AO pain was significantly longer than TMD pain. This agrees with epidemiological reports that the prevalence of TMD declines after middle age, which indicates that, with time, TMD symptoms may cease to exist in many patients, either due to the natural history of TMD or to successful treatment.[26] Systematic longitudinal epidemiological studies on AO have not yet been performed; thus, it is not known whether AO pain is life-long. Interestingly, the case histories differed between the groups; that is, 83% of the AO patients and only 15% of TMD patients reported onset of pain to be coincident with trauma or an invasive dental or surgical procedure. This lends support to a possible neuropathic etiology for AO (but not for TMD), because a relevant trauma to the peripheral nervous system had occurred in most of the AO group.

The self-reported pain-relieving and pain-worsening factors indicate some differences between AO and TMD. These findings suggest the possibility of some differences in the interaction between nociceptive information and jaw-motor function.

### Musculoskeletal Parameters

Musculoskeletal findings (mandibular range of motion, number of muscles painful to palpation, JFLS scores, and proportion of patients with a TMD diagnosis according to the RDC/TMD) were significantly different between AO and TMD patients, although half of the AO patients also suffered from myofascial TMD. In the present study, TMD patients exhibited a significant limitation in masticatory functioning (JFLS) compared with AO patients. This subjective limitation in jaw function was confirmed in the clinical measurement of jaw-opening capacity. This finding indicates that involvement of the masticatory system differs in the 2 conditions. TMD patients also had lower PPTs than AO patients on both masseter muscles and the hand, that is, both within and outside the trigeminal region. In addition, chronic TTH and widespread pain were more prevalent in the TMD patients compared with the AO patients, who in an earlier study were found to suffer more from TTH than a group of matched healthy subjects.[15] Based on these findings, it could be suggested that deep musculoskeletal pain in TMD patients is more generalized than in AO patients, possibly due to central sensitization. This agrees with several studies, which have demonstrated a high level of comorbidity in TMD patients.[27–29] However, central sensitization in AO patients may present as hypersensitivity to other stimuli than deep mechanical stimuli.

### Psychosocial Variables

Psychosocial variables and quality-of-life parameters were similar in both groups. Mean depression

and somatization scores were moderate to high in both groups, indicating a certain level of psychological distress. Earlier, it was reported that AO patients scored higher on the SCL-90 than healthy matched controls,[15] and several studies have found patients with TMD to have higher depression and somatization scores than the general population.[12,30,31] Because treatment outcome for pain is influenced by psychosocial factors, these 2 pain conditions share the management difficulties caused by the psychological distress that affects many of the patients.[32,33]

## Conclusions

The pain characteristics and clinical findings that most clearly distinguished AO from TMD in this exploratory study were report of dental trauma, jaw function, pain duration, and pain location. This result supports the most widely used classification of AO: Pain located in a region where a tooth has been endodontically or surgically treated, persistent chronic pain that had no pathological cause detectable in clinical or radiological examinations.[3,5,15] Still, more research on mechanisms in orofacial pain conditions is needed to clearly discriminate between them or, alternatively, to group them together on the basis of shared pain mechanisms.

## Acknowledgments

Supported by the Swedish Research Council and the Health Research Council in southeast Sweden.

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